



Biosynthesis of copper nanoparticles by using *Aloe barbadensis* leaf extracts and study of application in Congo red (Acid red 28) dye removal

Madiha Batool

Abstract

Development of green nanotechnology is generating interest of researchers toward eco-friendly biosynthesis of nanoparticles. In this study, biosynthesis of stable copper nanoparticles was done using *Aloe barbadensis* leaf extract. First of all, we prepared leaf extract of *Aloe barbadensis* in de-ionized water. This extract added to 1 mmol of copper sulfate solution and observed the change in color of the solution from colorless to dark brown colored solution. The present study tracing of an object is a green synthesis of copper nanoparticles by the interaction of leaf extract and copper salt and its dye removal efficiency. Copper-oxide nanoparticles in this study examined the efficient removal of Congo red CR dye. The effects of variables like concentration, time, pH, adsorbent dosage also examined in this present study. This was noted that maximum pH 3, the concentration of nanoparticles 1 mg, maximum time 120 minutes was optimum condition for dye removal. Biosynthesis of nanoparticle put forward a cost-free and environmentally suitable method of nanoparticle synthesis. The characterization of copper oxide nanoparticles like X-ray diffraction and SEM analysis showed that average particle size calculated was 40 nm. The shape of the copper nanoparticles was spherical and cubic and their range of grain was 80-120 nm. EDX of synthesized nanoparticles showed copper 38%. UV spectrophotometer analysis confirms peak of the copper nanoparticles between 200- 600 nm

Recent advances in the field of science and technology, particularly nanotechnology, have to lead to the development a new concept of synthesizing nanosized particles of desired size and shape. Hence, there is scope to develop new methods for the synthesis of nanoparticles which should be required inexpensive reagent, less drastic reaction condition and eco-friendly. In recent years, Cu nanoparticles have attracted much attention of researchers due to its application in wound dressings and biocidal properties. Nanotechnology deals with

the manipulation of matter at low size normally less than 100nm. Metallic nanoparticles can be prepared by the chemical and physical method. These methods have certain flaws like toxic chemicals and also dangerous to the environment. Developing research in green chemistry employed prominent part in nanotechnology to attain benefit to society. Surface area and mass ratios increase adsorption property. Therefore, the need for the development of a clean, reliable, biocompatible, benign and eco-friendly process to synthesize nanoparticles forced many researchers to develop green chemistry and bioprocesses. Green synthesis has been engaged in synthesis of highly stabilized nanoparticles. Nanoparticles integrity maintenance is the challenge of green synthesis. Copper nanoparticles were synthesized by leaf extract of aloe vera plant. The green synthesis of the copper nanoparticle is a speedy, economically feasible, and efficient method. Phenolic content in plant extracts dissolved in water, degradable and catalyzed synthesis of the nanoparticle as capping and a reducing agent. Synthesis of metal Nanoparticles has been an area of interest in recent past as Nanoparticles show unusual structural, electrical, optical and magnetic properties. The unique properties of Nanoparticles can be tailored to the growth of Nanoparticles. So it is the need of the hour to develop certain green methods of synthesis which have lesser detrimental effects on the environment. Alovera juice extolled for its soothing qualities, it is commonly used as an ointment for burns and skin abrasions. This ancient plant may offer deeper healing abilities. Most of.com are aware of the presence of aloe vera in cosmetics and skin creams; it clean skin and has anti-aging effects. People who live according to a natural health profile have long viewed the plant as a potent super food. Aloe vera keep antioxidant vitamins A, C, and plus vitamin B12, folic acid, and choline. It contains eight enzymes, e.g aliases, alkaline phosphatase, amylase, bradykinase, carboxypeptidase, catalase and cellulase.

Umesh Manni
Govenment College University, Pakistan, E-mail: tweetchem56@gmail.com



Minerals such as calcium, copper, selenium, chromium, manganese, magnesium, potassium and zinc are present in aloe vera. Leaves of aloe vera provide anthraquinones. Among these are aloin and emodin, which act as analgesics, antibacterial. Fatty acids are present, including cholesterol, campesterol and beta-sitosterol. These chemicals are responsible for reduction of copper. A copper nitrate solution of fifty milliliters was added to 5ml aloe vera extract. The solution was stirred on a magnetic stirrer at 120degrees. The color change was observed from blue to red. The resultant solution was centrifuged for ten minutes at speed of 50,000rpm. After discarding supernatant copper oxide nanoparticles were dried in a watch glass. Black colored particles were collected for characterization. Structural, chemical composition, size and shape of copper oxide nanoparticles were analyzed by SEM(), XRD(), EDX, TEM and UV spectrophotometer(DB-20).

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